CLAIMS

WHAT IS CLAIMED IS:

1. A bumper for mounting on a frame of a vehicle, the bumper comprising:

an elongated beam configured to be operatively mounted to the frame of the vehicle;

a foam portion extending along a portion of the beam;

a fascia surrounding the foam portion, the fascia and the foam portion operatively attached to the beam;

the foam portion having at least one recess formed therein, the at least one recess extending through a predetermined thickness of an inside portion of the foam portion; and

a cylindrical cell matrix disposed in the at least one recess, and configured to absorb energy resulting from impact force applied to an external portion of the bumper.

2. The bumper according to claim 1 wherein the matrix forms an interference fit with the recess.

3. The bumper according to claim 1 wherein the matrix is secured within the recess with chemical adhesive.

4. The bumper according to claim 1 wherein the matrix is molded within the recess with the foam portion during a molding process.

5. The bumper according to claim 1 wherein the recess extends through the foam for the predetermined distance of about between forty percent to eight-five percent of a thickness of the foam portion.

6. The bumper according to claim 1 wherein the recess extends through the foam portion for the predetermined distance of about between sixty percent to ninety percent of a thickness of the foam portion.

7. The bumper according to claim 1 wherein a front portion of the matrix is substantially flush with a front portion of the foam portion along an interface defined between the beam and the foam portion.

8. The bumper according to claim 1 wherein the foam portion is formed of low-density foam.

9. The bumper according to claim 8 wherein the low-density foam has a density of

about between two pounds per cubic foot and eight pounds per cubit foot.

10. The bumper according to claim 1 further including a high-density panel disposed within the recess, the high-density panel disposed in front of the matrix and configured to distribute impact force directed against the bumper across a portion of the matrix.

11. The bumper according to claim 1 wherein the matrix is sandwiched between a plurality of high-density panels, said matrix and high-density panels retained within the recess.

12. The bumper according to claim 1 wherein the high-density panel is selected from the group consisting of high-density foam, high-molecular weight structural foam molding, high-density composite material, polyester sheet-molded material, vinyl-ester sheet-molded material, thermoplastic composite, bulk-molded compound, and high-molecular weight injection molded polyethylene.

13. A bumper for mounting on a frame of a vehicle, the bumper comprising:

an elongated beam configured to be operatively mounted to the frame of the vehicle;

a foam portion extending along a portion of the beam;

a fascia surrounding the foam portion, the fascia and the foam portion operatively attached to the beam;

the foam portion having a plurality of recesses formed therein, the recesses extending through a predetermined thickness of an inside portion of the foam portion; and

an integrated cylindrical cell matrix disposed with the recesses, the matrix formed of a plurality of cylindrical cells having a longitudinal axis;

the matrix configured to absorb energy resulting from impact force applied to an external portion of the bumper in a direction generally along the longitudinal axis.

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